

Sub  
Ry

**ABSTRACT OF THE DISCLOSURE**

5           A beam control system and method. In an illustrative embodiment, the inventive system (500) provides a first beam of electromagnetic energy (503); samples the first beam (503) and provides a second beam (505) in response thereto; detects aberrations in the second beam (505); and corrects aberrations in the first beam (503) in response to the detected aberrations. In a specific implementation, the invention (500)  
10 includes a beam director telescope (510) having a primary mirror (516) on which a holographic optical element (518) is disposed. The holographic optical element (518) samples the output high-power beam and provides a sampled beam to a wavefront sensor (520). The wavefront sensor (520) provides signals to an adaptive optics processor (580). The adaptive optics processor (580) analyzes the sampled wavefront,  
15 detects aberrations therein and provides a correction signal to an optical phased array (550). A master oscillator (552) provides a reference beam, which reads the optical phased array (550) and is back reflected off a front surface of an aperture sharing element (540). The resulting beamfront is conjugated by a first phase conjugate mirror (546) and then again by a second phase conjugate mirror (556). The output of the  
20 second phase conjugate mirror (556) is amplified and reflected off the front surface of the aperture sharing element (540). The aperture sharing element (540) outputs the high power beam via the telescope (510) which is corrected for the optical distortions in the telescope and beam path.